street pipes in lieu of wooden ones were introduced at the end of the last century, and the plan of filtration in 1829 by the Chelsea Company.

The tidal portion of the Thames at Hammersmith and Kew afforded a supply only thirty years ago, until the companies were at length compelled to take their supplies from above Teddington Weir, so as to be out of tidal influence. Five London Water Companies have the power to draw about 110,000,000 gallons per day from the river; its minimum flow during the minimum month of dry years is 350,000,000 gallons per diem. Mr. Beardmore estimates the amount of rainfall run off the Thames basin above Kingston from 1850 to 1868, to give a mean annual rate of 7·83 inches, while the mean rainfall at Oxford was 26·08, the rest of the rainfall being evaporated, or absorbed by vegetation. The head waters of the Thames are maintained by springs of the oolites, but these lose their volume after drought, the dry-weather flow of the river being maintained by the deep-seated springs of the chalk, which occupies an area in the Thames Basin, above Kingston, of 1,047 square miles, and has, according to Mr. Beardmore, a storing capacity of sixteen months.

Large numbers of wells have been sunk in the metropolitan area during the present century, into the Thanet Sands, underlying the London Clay; as these by pumping became exhausted, the chalk was penetrated, and the rainfall which is absorbed in the Hertfordshire and Surrey Hills, and flows down the dip planes of the strata under the London clay of the Thames Basin, was pumped up by the brewers and other large consumers. The constant tax, however, on this supply has caused a steady and increasing depression in the level to which the water will rise, and has necessitated in many instances the lowering of the pumping machinery in the metropolis.

Eighteen million gallons[1] daily of water of the River Lea that would have naturally gravitated towards London is intercepted by the New River Company, who pump their chalk wells most, when the River Lea is driest, and thus draw upon the deeper springs, which would not in ordinary course have reached the surface in that area.

Following the example of some 100 or more provincial towns that have acquired the control of their own waterworks, the Metropolitan Board of Works have laid before Parliament a bill to acquire the rights of the whole of the London water companies, which, at twenty years' purchase, are valued at fifteen million pounds, an amount steadily increasing, and have coupled it with another bill, to give effect to Messrs. Bramwell and Easton's proposal to sink chalk wells for a separate supply for drinking purposes. Influenced probably by the enormous cost of the one scheme, and the inconvenience attendant on the laying of 2,600 miles of new pipes in the other, the proposals are not supported by the ratepayers, who appear to consider "living organisms" in the water now supplied to them a minor evil. The "purchase bill" is now, however, abandoned for this session, and the "well scheme" will probably rest for the present.

An extension of Mr. Bateman's project for bringing the Vyrnwy and other head waters of the Severn to the metropolis, has recently been suggested for the future requirements of Liverpool, sixty miles distant; the watersheds between the Mersey, Dee, and Severn basins are very low, so that little tunnelling would be required. The scheme is stated by Mr. Hugh Williams, who suggested it, to be capable of yielding, if required, no less than 193,000,000 gallons of water daily, after allowing for compensation, a quantity which would suffice for the wants of six millions of our population, and could not fail to have a salutary influence on the floods of the Severn.

CHARLES E. DE RANCE

NOTES

SINCE our last number appeared American science has sustained a loss which will be universally deplored. Prof. Joseph Henry, the Director of the Smithsonian Institution, whose labours for the progress of science, all the world over, have been increasing, is no more. We shall take an early opportunity of referring to his long-continued labours for the furtherance of natural knowledge among men.

WE understand that Mr. E. Roberts, of the *Nautical Almanac* office, has been requested by the India office to construct for use in India a self-acting tide-calculating machine. It will be designed not only to predict the tides at open-coast stations, but also river and shallow-water tides. It will be a great improvement on the tide-calculating machine at South Kensington (now temporarily at the Paris Exhibition), inasmuch as the tides caused by the smaller lunar perturbations will be included. Each component will be fitted with a slide, so that no error will be caused from the excentricity of the pullies. The ordinates of the curves traced by the machine being as much as eighteen inches, the use of the slides is imperative. Mr. Roberts has calculated new numbers to represent the periods of the many components, and with such success, that the actual error of any one component, after a run representing a year's predictions, will not exceed the limit of error of setting the component at the commencement. The machine will be fitted with self-regulating driving-gear, so that it can be set at the close of the day and the whole year's curves be ready for reading off by the next morning. The machine is expected to be finished towards the end of the year. Now that the immense labour (the only objection raised against the employment of tidal predictions by harmonic analysis) is superseded, it is to be hoped that the Admiralty will avail themselves of an instrument, the results of which are so vastly superior to those now obtained with considerable labour by actual computation.

PROF. HUXLEY has been elected a corresponding Fellow of the Royal Academy of Rome, in the Department of Natural History.

WE learn that the following gentlemen, all highly distinguished for their numerous original researches and published memoirs on physiological and systematic botany, have recently been elected foreign members of the Linnean Society of London:—viz., Prof. Teodoro Caruel, of Pisa, Dr. Ernest Cosson, of Paris; Dr. George Engelman, of St. Louis, Missouri, U.S.; Prof. Eduard Fenzl, of Vienna; and Prof. Julius Sachs, of Würzburg.

ON April 29 a monument, in memory of the great physicist, Alessandro Volta, was unveiled at Pavia. Most of the Italian Universities, and several foreign scientific societies had sent deputies to Pavia University for this event. The monument is a masterpiece of the sculptor Tantardini of Milan. The ceremony of unveiling was followed by a dignified celebration at the University, and upon that occasion the following gentlemen were elected honorary doctors of the scientific faculty: Professors Clerk Maxwell (Cambridge) and Sir W. Thomson (Glasgow); M. Dumas (Paris), Dr. W. E. Weber (Leipzig); Professors Bunsen (Heidelberg) and Helmholtz (Berlin), Dr. F. H. Neumann (Koenigsberg), and Dr. P. Riess (Berlin).

THE death is announced of Roberto de Visiani, "the Nestor of Italian botanists," Professor of Botany at Padua, aged seventy-eight.

WE notice the death in Berlin on April 22 of the well-known astronomer Prof. Wolfers. For many years he was connected with the Berlin Observatory, and, as editor of the *Jahrbuch* issued from this institution, he has for the past forty years rendered services of the greatest value to astronomy. His researches in meteorology have likewise made him known to a wide circle. The most important of these were his comparative statistics on the winter weather of Berlin, compiled from a long series of careful and minute observations. Prof. Wolfers was aged seventy-five at the time of his death.

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[1] The New River also receives 3½ million gallons daily from the Chadwell Spring, and the water obtained from various wells in the chalk.

M. FERDINAND HOEFFER died at Sannois, a small country-place in Seine-et-Oise, on May 8, at the age of sixty-eight years. He was the editor of the *Biographie générale*, published by Firmin Didot in sixty 8vo volumes. Most of the scientific memoirs in that immense work were written by him, and he was the author of a large number of historical works on astronomy and chemistry.

MARIETTE BEY, the Egyptologist, who has rendered such valued services to archæology, has been elected a member of the French Institute.

THE statue of the philosopher, Giordano Bruno, will be dedicated at Rome on February 17, 1879. On the same day, in the year 1600, he was burned at the stake, in Rome, by the Inquisition.

THE festive celebration of the fiftieth anniversary of the foundation of the Royal Polytechnic Institution of Dresden took place on May 1, and was attended by many eminent men of science and other persons of note.

A PROMINENT feature at the late banquet of the Berlin Geographical Society was the speech of the representative from the Paris Society. His concluding wish that the festival might serve towards the scientific fraternisation of the two nations, was greeted with loud applause, which was redoubled as the Crown Prince of Germany rose to publicly shake hands with the French Ambassador.

ONLY last week we noticed Capt. Burton's narrative of his visit in the spring of last year to the Land of Midian. The results of this visit were so full of promise for the empty exchequer of the Khediv (as Capt. Burton scolds us into spelling the title), that the almost veteran explorer returned again with a more formidable expedition in December last, and spent four months examining the region, during which the expedition travelled and voyaged upwards of 2,500 miles. They brought home some twenty-five tons of geological specimens to illustrate the general geological formation of the land; six cases of Colorado and Negro ore; five cases of ethnological and anthropological collections—such as Midianite coins, inscriptions in Nabathean and Cufic, remains of worked stones, fragments of smelted metals, glass, and pottery; upwards of 200 sketches in oil and water colours, photographs of the chief ruins, including the catacombs, and of a classical temple, apparently of Greek art; and, finally, maps and plans of the whole country, including thirty-two ruined cities, some of whose names can be restored by consulting Strabo and Ptolemy, besides sketches of many *ateliers* where perambulating bands like the gipsies of ancient and modern times seem to have carried on simple mining operations. Among the specimens are argentiferous and cupriferous ores from Northern Midian, and auriferous rocks from Southern. There are collections from three turquoise mines; the northern, near Aynuneh, already worked; the southern, near Ziba, still scratched by the Arabs; and the central, until now unknown save to the Bedouins. There are, moreover, three great sulphur beds, the northern and the southern, belonging to the secondary formation (now invaded by the trap granite), and the central, near the port of Mowilah, of pyretic origin. Rock salt accompanies the brimstone, and there are two large natural salt lakes. The whole of the secondary formation supplies fine gypsum, and in parts of it are quarries of alabaster, which served to build the ruins of Maghair, Sheeayb, Madiama (of Ptolemy), and el-Haurá (Leuke Kome), the southernmost part of western Nabathea. Specimens of the ores will be sent to Paris and London; the rest will be analysed in Cairo by a local commission, while the curiosities of all kinds, after being exhibited in Cairo, are to be sent to the Paris Exhibition.

WHAT may be called excursional education is finding very great favour with the lively French, and threatens to be applied in a variety of directions. The largest private school in Paris, that of Sainte-Barbe, near the Panthéon, which was established in the fifteenth century, and is now the property of a company, has just inaugurated a system of tours for teaching foreign languages. Forty of the pupils have been sent to Carlsruhe, in Germany, where they will be boarded in a number of families for several months, and receive their regular instruction from a staff of German teachers. Next year there will be an English tour, very likely to London. The pupils have been carefully selected from amongst those who are most likely to benefit from this practical system of international education.

SOME important improvements upon Prof. Bell's telephone have recently been made and patented by Mr. E. Cox Walker, electrician (of the firm of Messrs. T. Cooke and Sons) of York. The improvements consist in doubling or quadrupling the diaphragm and its accessories, and dividing the mouthpiece so that to each diaphragm there is a corresponding sub-mouthpiece. Instead of using two or four single magnets, Mr. Walker adopts one or two magnets somewhat of a horse-shoe shape, the coils being connected as for ordinary horse-shoe electro-magnets, and the connections made with the transmitting wire in the ordinary way. Taking the quadruplex mouthpiece as an example it might be explained thus: the ordinary single telephone mouthpiece is elongated, and instead of the orifice leading direct to the diaphragm it is divided into four smaller channels, each of which collects and directs the sound on to the diaphragms covering the magnets. Mr Walker does not have a separate diaphragm for each pole or coil, but has so constructed the under side of the mouthpiece that it nips the diaphragms tightly across the middle and around the opening containing the coils, and virtually divides them. Mr. Walker has also recently made an octoplex instrument, which, by adding to the number of coils, diaphragms, and corresponding divisions in the mouthpiece gives eight times the intensity of a single one. Besides the mouthpieces, Mr. Walker has patented improved earpieces. The instrument was exhibited at the Royal Society's *soirée* on May 1, and at the Royal Institution on May 3.

THE Montsouris Observatory has established at the Champ de Mars a pavilion where all the observations will be conducted on the same principles as at the establishment, and the principal registering apparatus in use will be put in operation before the public. The Meteorological Society has also established another pavilion where the telegraphic warnings of the international service will be posted daily. A collection of all the meteorological journals published by the several offices will be exhibited every day for comparison. From May 1 the French service publishes daily two maps giving the state of the weather at 7 A.M. in summer time. The first of these maps gives isobaric lines with the variations in the last twenty-four hours expressed in tenths of millimetres. The second gives the isothermal lines with thermometric variation in the past twenty-four hours expressed in tenths of centigrade degrees. The isobaric map shows, by conventional signs, the state of the sky, force and direction of winds, and state of the sea. The isothermal map shows, by other signs, the extent of rains, their importance, and the limits of congelations. The Pic du Midi and Puy de Dome observatories will also send the results of their daily observations, which will be posted in a conspicuous part of the establishment.

LIEUT. G. R. R. SAVAGE, R.E., writing from Roorkee, North-West Provinces, India, sends us an account of some interesting experiments he has been making on long-distance telephones. He constructed telephones expressly for long-distance work, and succeeded in getting a bugle-call heard distinctly over 400 miles of Government telegraph line, the wire being one of the four or five main up-country telegraph wires which are carried on one set of posts. The telephones used, Lieut. Savage constructed with about 400 ohms of No. 38 gauge wire, vibrating disc about 2½ inches diameter, the sending vibrating disc thicker a *little* than the receiving one. It seems to him right to oppose the work done at the receiving end as little as possible by having a very thin vibrating disc; while he had noticed that, *cæteris paribus*, a thicker disc approached to a telephone magnet gives a greater deflection on a distant very sensitive galvanometer, so long, of course, as it is not too thick. Lieut. Savage asks the reason for the following circumstance:—Taking off the vibrating disc of a telephone, and tapping the magnet with any diamagnetic substance, brass, glass, &c., the tapping sound is heard distinctly at a distant telephone. This cannot be caused in the same way as the current in Prof. Bell's telephone; it must be caused, he supposes, by the particles of magnet being caused to vibrate longitudinally, and as the coil does not vibrate in unison with the particles of the magnet, the permanent lines of magnetic force must be cut by the coil, and hence a current. Hence, he asks, if this is the case, might not there be two causes combined producing the effect in Prof. Bell's telephone, both approach of disc and also longitudinal vibrations? Lieut. Savage constructed a small induction coil with soft iron core, the outer and inner coil the same. He heard and sent messages easily seventy or eighty miles by joining the two coils separately in circuit with the sending and receiving telephone. Of course there was no *increase* in any way, as no energy was expended on the current by the simple induction coil; there was a slight decrease in the sound. He thinks about 350 ohms of No. 38 wire makes the best coil for a telephone magnet ¼-inch diameter.

MR. C. F. CREHORE, of Boston, U.S., sends us an amusing incident, *à propos* of the subject of fetichism in animals referred to by Mr. Romanes recently in NATURE. A brave, active, intelligent terrier, belonging to a lady friend, one day discovered a monkey belonging to an itinerant organ-grinder, seated upon a bank within the grounds, and at once made a dash for him. The monkey, who was attired in jacket and hat, awaited the onset with such undisturbed tranquillity that the dog halted within a few feet of him to reconnoitre. Both animals took a long steady stare at each other, but the dog evidently was recovering from his surprise, and about to make a spring for the intruder. At this critical juncture, the monkey, who had remained perfectly quiet hitherto, raised his paw and gracefully saluted by lifting his hat. The effect was magical; the dog's head and tail dropped, and he sneaked off and entered the house, refusing to leave it till he was satisfied that his polite but mysterious guest had departed. His whole demeanour showed plainly that he felt the monkey was something "uncanny," and not to be meddled with.

THE earthquake of April 26 in the vicinity of Constantinople was felt even more severely farther inland. At Nicomedia damage to the value of £300,000 was caused, and an entire village was destroyed with a loss of forty lives. Three smart shocks of earthquake were felt at 7 A.M. on the 14th inst., at Hennebout (Morbihan, France), the motion being from west to east.

THE Society of Telegraph Engineers have appointed a special meeting on Thursday, the 23rd inst., at the Institution of Civil Engineers, 25, Great George Street, Westminster, when a paper will be read by Mr. W. H. Preece, on the connection between Sound and Electricity, illustrated by Prof. Hughes' recent discoveries.

JANSEN, MCCLURG AND CO., of Chicago, will shortly publish a new and greatly enlarged and improved edition of Prof. Jordan's "Manual of the Vertebrates of the United States." The section on fishes, the *Nation* states, will be entirely rewritten.

A TELEGRAM from Adelaide, dated the 8th instant, intimates that copious rains have fallen in South Australia. As heavy rains have been previously reported from other parts of Australasia and Cape Colony, the great drought which has been so disastrous over the greater part of the Southern hemisphere may now be regarded as at an end.

THE Rev. James M. Crombie, F.L.S., author of "Lichenes Britannica," has been appointed to the Lectureship on Botany at St. Mary's Hospital, recently held by Dr. H. Trimen.

AMONG the scientific productions of Germany during the past month, we notice a new edition of Liebig's classic "Chemische Briefe," "Beiträge zur fossilen Flora Schwedens," by A. G. Nathorst (Stuttgart); "Astronomisch-geodätische Arbeiten in 1876," by the Prussian Geodetic Institute (Berlin); "Die Familien-diagramme der Rhocadinen," by F. Schmitz (Halle); "Geologie der Insel Luzon," by R. von Drasche (Vienna); "Systematisches Verzeichniss der Macro-lepidopteren von Nordamerika," by B. Gerhard (Berlin); "Das Klima Ostasiens" by H. Fritsche (Leipzig); "Die Käfer von Nassau und Frankfurt," by L. von Heyden (Wiesbaden); "Die Figur der Erde," by H. Bruns (Berlin); "Bericht über die 1 u. 2 Jahresversammlung der deutschen ornithologischen Gesellschaft," by F. Cabanis (Leipzig); the fifth edition of Prof. Lenz's "Die Reptilien, Amphibien, Fische und Wirbellosen Thiere;" "Der Mensch und das Thierreich," by Professors Krass and Landois, of Münster; "Was da kriecht und fliegt!" by Prof. Taschenberg; and "Europas Kriechthiere und Lurche," by Dr. Knauer, of Vienna.

SEVERAL correspondents write concerning a bright meteor seen on Sunday night. Mr. Whitley Williams saw it when in the open fields, about three-quarters of a mile west of Lillie Bridge. The meteor bore 1° or 2° to the west of north, and elevated approximately 20° above the horizon. It was very brilliant, even dazzling in appearance, its light having a bluish shade like that of burning magnesium. It descended from right to left at an apparent angle of 60° or more with the horizon, and described an arc of 5° or 10°, at the latter end of which it was hidden behind a cloud. The sky was overcast with a few very black clouds, and only one or two stars visible. The meteor gave the impression of being very near. A correspondent at Higher Walton, near Preston, May 14, saw it about 8.51 P.M. in a direction almost due north. It was travelling from east to west; altitude when first seen, about 60°, when last seen, about 15°. Its velocity was comparatively slow, being visible for five or six seconds. During the motion a tail, the length of which subtended an angle of about 3°, followed the nucleus. When near the end of its motion the tail disappeared, and the nucleus broke up into several pieces, and shortly disappeared. No sound was heard. "D. R. S." saw it from Kirknewton, Edinburghshire. The meteor seemed to rise from a point about 30° east of the moon at the time, and travelled in rather a leisurely manner through an arc of about 73°, in a direction of about north-west by north, leaving a trail of stars behind it, then burst into pieces and disappeared, without any report. It was of a fine violet colour. It seemed oblong in form and irregular in outline from giving off sparks so rapidly.

THE additions to the Zoological Society's Gardens during the past week include a Jaguar (*Felis onça*) from South America, presented by Major Wood; a Two-spotted Paradoxure (*Nandinia binotata*) from West Africa, presented by Capt. E. J. Hawes; a Black-backed Jackal (*Canis mesomelas*) from South Africa, presented by Mr. Richard Seyd, F.Z.S.; a Toque Monkey (*Macacus pileatus*) from Ceylon, presented by Master R. C. Heyworth; a Bonelli's Eagle (*Nisaetus fasciatus*), European, presented by Lord Lilford, F.Z.S.; a Leadbeater's Cockatoo (*Cacatua leadbeateri*) from Australia, presented by Mrs. Tennent; a Goffin's Cockatoo (*Cacatua goffini*) from Queensland, presented by Mrs. Pitt; a White-backed Piping Crow (*Gymnorhina leuconota*) from Australia, presented by Mr. John Ritchie; three Water Ouzels (*Cinclus aquaticus*), European, presented by Mr. R. J. L. Price, F.Z.S.; a Slow Loris (*Nycticebus tardigradus*) from Malacca, received in exchange; a Darwin's Pucras Pheasant (*Pucrasia darwini*), a Wonga-wonga Pigeon (*Leucosarcia picata*), nine Chilian Pintails (*Dafila spinicauda*), bred, a Reindeer (*Ranifer arandus*), born, in the Gardens.

ACADEMIC LIBERTY IN GERMAN UNIVERSITIES[1]

THIS liberty without control is a subject of astonishment to most strangers who know it only by certain very apparent eccentricities. They cannot understand how we are able, without great inconveniences, to leave young people to themselves in this way. The German remembers the student-period as the golden age of his life; our literature and our poetry are filled with the expression of this sentiment. We do not encounter anything similar to it among other European peoples. The German student is the only one who tastes an unmingled joy at the time when, in the first delight of his young independence, yet free from the anxieties of mercenary work, he may consecrate his hours exclusively to all that is noblest and best in science and in the conceptions of humanity. United by a friendly rivalry with numerous comrades devoted to the same efforts, he finds himself daily in intellectual communication with masters from whom he learns what is the movement of thought among independent spirits. I appreciate at its full value this last advantage, when, looking back, I recall my student days and the impression made upon us by a man like Johannes Müller, the physiologist. When one finds himself in contact with a man of the first order, the entire scale of his intellectual conceptions is modified for life; contact with such a man is perhaps the most interesting thing which life may have to offer.

You possess, my young friends, in this liberty of German students, a precious and glorious legacy of past generations. Preserve it in order that you may leave it in your turn to those who will come after you, and strive to ennoble and purify it still more. To guard it intact you have, each for himself, to see that the studious youth of Germany continue worthy of the confidence which has secured for them so high a degree of liberty. There is here for feeble characters a gift as calamitous as it is precious for the strong. Do not be astonished that statesmen and fathers of families think sometimes of instituting among us a system of surveillance and control analogous to that which exists in England. There is no doubt that such a system would save many whom liberty allows to run to ruin. But the State and the nation have more to expect from those who are capable of supporting liberty and whose efforts and work are the results of their own individual energy, of their dominion over themselves, and their love of science.

I have spoken above of the influence which may be exercised by intellectual contact with remarkable men; this leads me to point out another characteristic feature which distinguishes German universities from those of England and France. With us the student goes, as soon as possible, to seek instruction from masters who have proved their merit by doing something for the progress of science, which, in our eyes, is the best mark of their fitness to educate. Yet this is a thing which excites great astonishment among the English and French. They attach more importance than the Germans to a pretended talent for instruction, which consists in the faculty of expounding the subject of instruction in a clear and well-ordered form, and, if possible, in an eloquent and interesting manner, calculated to captivate the attention. At the Collége de France, the Jardin des Plantes, as also at Oxford and Cambridge, the lectures of renowned speakers are the rendezvous of the fashionable and cultivated world. In Germany we are not only indifferent to the oratorical apparatus, we are hostile to it; we undoubtedly neglect too much the external form. There is no doubt that a good exposition demands from the listener much less sustained efforts than a bad one; it enables the subject to be comprehended much more surely and much more completely, and with a well-ordered arrangement, bringing into strong relief the principal points and the divisions, much more can be overtaken in the same space of time. I do not pretend, then, to justify the contempt of form, which we often push too far, both in speaking and in writing. But it cannot be denied that many men of great intellectual originality and of remarkable scientific value, have a dull, painful, and embarrassed elocution. Yet I have often seen such professors attract numerous and faithful hearers, while orators void of thought astonished at their first lecture, fatigued at the second, and were deserted at the third. He who wishes to inspire his audience with a complete conviction of the truth of what he advances, ought, above all, to know from personal experience what produces conviction. It is necessary then that he has known how to advance alone into a region where no one has ever broken ground; in other words he must have worked upon the frontiers of human science and conquered for himself new domains. A master who presents only results acquired by others suffices for scholars to whom authority is given as the source of their science, but not for those who desire to deepen their convictions to their final foundations.

There is here, you see, gentlemen, a new sign of confidence given you by the nation. There are neither fixed courses nor fixed professions imposed upon you. You are treated as men whose free adhesion must be gained, who know how to distinguish between being and seeming, whom it is no longer sought to persuade by appealing to any authority whatever, and who, moreover, would not allow themselves to be persuaded in that fashion. It is sought, more and more, to provide you with the means of drinking science at the very fountain, either in books and historical collections, or by observation of objects and natural pheomena and by experiments. The smallest German universities have their own libraries, their mineralogical collections, &c. As regards the organisation of laboratories of chemistry, micrography, physiology, physics, Germany is ahead of all other European countries, who are only just beginning to seek to rival us. In our own university, we shall assist in a few weeks at the opening of two important establishments devoted to education in the natural sciences.

To obtain the free conviction of the pupils, it is necessary that the conviction of the masters be freely expressed; *liberty of education* is demanded. That has not always been protected from all encroachment in Germany more than in neighbouring countries. In times of political and religious strife the dominant parties have often interfered in the domain of science; but the German nation has always regarded such interferences as encroachments upon sacred ground. Here, again, the progress of political liberty in the new German Empire has been salutary. To-day, in the German universities, the most extreme results of materialistic metaphysics, the most daring speculations in the direction of the Darwinian theory of evolution, may be published without hindrance, as well as the most complete deification of the infallible Pope. No more than on the floor of European parliaments is it permitted to calumniate the intentions and outrage the person of an opponent—these are proceedings which have nothing to do with the discussion of a scientific proposition. It is also forbidden to excite to the commission of acts interdicted by the laws; but we may, without the least hindrance, discuss *scientifically* any controverted *scientific* point whatever. Liberty of education, in this sense, does not exist in the English and French universities. At the Collége de France, even a man of so high a scientific reputation as Ernest Renan has been placed under interdict. The tutors of the English universities may not diverge by a hair's breadth from the dogmatic system of the Anglican Church without exposing themselves to the censure of the archbishops and losing their pupils.

It remains for me to consider our liberty of education in another aspect. I wish to speak of the liberality with which our universities award the authority of professor.

In the etymological sense of the term, a *doctor* is a man *who teaches*, or at least, a man recognised as capable of teaching. In the universities of the middle ages, every *doctor* who found

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[1] Rectorial Address of Prof. Helmholtz, F.R.S., at the University of Berlin. Continued from p. 53.